STRATEGY FOR RECOVERY

A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including for both spawning and rearing, as well as for foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area on which to gauge recovery within a recovery unit. Within a core area, many local populations may exist.

The Snake River Washington Recovery Unit Team has identified priority streams within each core area (Appendices A and B) that either currently supply habitat elements necessary for long-term security or have a reasonable potential to be restored and supply elements for the long-term security of bull trout. Using the criteria below and professional judgment, the Snake River Washington Recovery Unit Team identified priority streams to focus the implementation of recovery activities to areas having the greatest potential to support bull trout. These priority streams include 1) known bull trout spawning streams; 2) streams that have evidence of bull trout recruitment and early life stage rearing; and 3) streams with habitat that may potentially support some level of recruitment, or local populations, since current habitat conditions have elements necessary for bull trout occupancy. Selected priority streams are considered the best of the best-remaining habitat for bull trout.

While there are many streams in both core areas that do not conform to the criteria established by the Snake River Washington Recovery Unit Team at this time, the recovery unit team recognizes that other streams in the core areas may provide elements necessary for self-sustaining local populations and will be included in recovery efforts if deemed appropriate in the future. The Snake River Washington Recovery Unit Team also acknowledges that there are stream segments that have not been identified as priorities for the reestablishment of local populations, but that they provide necessary components to the long-term security of a local population.

Factors for selecting priority streams that either currently or may potentially support local populations in the Snake River Washington Recovery Unit include the following:

1. Current or historic distribution
2. Sightings within the last 10 years
3. Water temperatures
4. Amount of public versus private land
5. Current habitat conditions
6. Restoration potential/"quick fix"
7. Poaching threats/accessibility
8. Exotic fish species presence/absence

Assessment of these factors was also used to prioritize streams and local populations (Appendices C and D) within the Snake River Washington Recovery Unit and may be used during recovery task implementation by management agencies to determine which streams will be the first for restoration and recovery activities

Pataha Creek and Hixon Creek have been identified as priority streams in the Tucannon River Core Area and are considered essential to the recovery of potential local populations of bull trout. Pataha Creek contained bull trout historically (Groat, pers. comm., 2002a). Hixon Creek is a priority stream because it contains habitat that may support bull trout. Both Pataha Creek and Hixon Creek may contain habitat that is essential to expand the distribution and abundance of bull trout.

George Creek, Coombs Creek, Hefflefinger Creek, and lower Wormell Gulch Creek have been identified as priority streams in the Asotin Creek Core Area and are considered essential to the recovery of potential local populations of bull trout. While bull trout have not been identified in these streams, the streams are identified as priority streams because they, at least in part, contain habitat that is suitable for bull trout. They, therefore, may need habitat restoration and protection to help increase bull trout distribution and abundance in the Asotin Creek Core Area.

The Snake River Washington Recovery Unit Team has identified the mainstem reaches of the Tucannon River and Asotin Creek as priority water bodies or core habitat. These reaches may serve as important migratory corridors and as overwintering, foraging, and rearing areas for juvenile, subadult, and adult bull trout. The recovery unit team believes that if habitat in the mainstem of Asotin Creek is currently degraded to the extent that it will not support migration by adult bull trout, restoration of the migratory corridor is critical to expand the number of local populations and to increase the likelihood that local populations spawning in headwater areas persist in the long term.

Recovery Goals and Objectives

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted**. To achieve this goal, the following objectives have been identified for bull trout in the Snake River Washington Recovery Unit:

- Maintain the current distribution of bull trout and restore distribution in previously occupied areas within the Snake River Washington Recovery Unit.

- Maintain stable or increasing trends in bull trout abundance.

- Restore and maintain suitable habitat conditions for all life history stages and forms.

- Conserve genetic diversity and provide opportunity for genetic exchange.

Rieman and McIntyre (1993) and Rieman and Allendorf (2001) evaluated the bull trout population numbers and habitat thresholds necessary for long-term viability of the species. They identified four elements, and the characteristics of those

elements, to consider when evaluating the viability of bull trout populations. These four elements are (1) number of local populations; (2) adult abundance (defined as the number of spawning fish present in a core area in a given year); (3) productivity, or the reproductive rate of the population (as measured by population trend and variability); and (4) connectivity (as represented by the migratory life history form and functional habitat). For each element, the Snake River Washington Recovery Unit Team classified bull trout into relative risk categories based on the best available data and the professional judgment of the team.

The Snake River Washington Recovery Unit Team also evaluated each element under a potential recovered condition to produce recovery criteria. Evaluation of these elements under a recovered condition assumed that actions identified within this chapter had been implemented. Recovery criteria for the Snake River Washington Recovery Unit reflect (1) the stated objectives for the recovery unit, (2) evaluation of each population element in both current and recovered conditions, and (3) consideration of current and recovered habitat characteristics within the recovery unit. Recovery criteria will probably be revised in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information on bull trout, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as a best estimate.

This approach to developing recovery criteria acknowledges that the status of populations in some core areas may remain short of ideals described by conservation biology theory. Some core areas may be limited by natural attributes or by patch size and may always remain at a relatively high risk of extinction. Because of limited data within the Snake River Washington Recovery Unit, the recovery unit team relied heavily on the professional judgment of its members.

Local Populations. Metapopulation theory is an important consideration in bull trout recovery. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994) (see Chapter 1). Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic

events. In part, distribution of local populations in such a manner is an indicator of a functioning core area. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than 5 local populations are at increased risk, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk.

For the Tucannon River Core Area, there are currently eight known local populations; for the Asotin Creek Core Area, there are two known local populations. Using the above guidance, the Snake River Washington Recovery Unit Team believes that bull trout in the Tucannon River Core Area are at intermediate risk, while those of the Asotin Creek Core Area are at increasing risk.

Adult Abundance. The recovered abundance levels in the Snake River Washington Recovery Unit were evaluated by considering theoretical estimates of effective population size, historical census information, and the professional judgment of recovery team members. In general, effective population size is a theoretical concept that allows us to predict potential future losses of genetic variation within a population due to small population sizes and genetic drift (see Chapter 1). For the purpose of recovery planning, effective population size is the number of adult bull trout that successfully spawn annually. Based on standardized theoretical equations (Crow and Kimura 1970), guidelines have been established for maintaining minimum effective population sizes for conservation purposes. Effective population sizes of greater than 50 adults are necessary to prevent inbreeding depression and a potential decrease in viability or reproductive fitness of a population (Franklin 1980). To minimize the loss of genetic variation due to genetic drift and maintain constant genetic variance within a population, an effective population size of at least 500 is recommended (Franklin 1980; Soule 1980; Lande 1988). Effective population sizes required to maintain long-term genetic variation that can serve as a reservoir for future adaptations in response to natural selection and changing environmental conditions are discussed in Chapter 1 of the recovery plan.

For bull trout, Rieman and Allendorf (2001) estimated that a minimum number of 50 to 100 spawners per year is needed to minimize potential inbreeding effects within local populations. In addition, a population size of between 500 and

1,000 adults in a core area is needed to minimize the deleterious effects of genetic variation from drift.

For the purposes of bull trout recovery planning, abundance levels were conservatively evaluated at the local population and core area levels. Local populations containing fewer than 100 spawning adults per year were classified as at risk from inbreeding depression. Bull trout core areas containing fewer than 1,000 spawning adults per year were classified as at risk from genetic drift.

Adult abundance in the Tucannon River Core Area was estimated (based on redd counts) at 600 to 700 adult spawners per year in the eight known local populations. Adult abundance in the Asotin Creek Core Area was estimated at less than 300 individuals in two known local populations, based on the results of bull trout surveys. Based on the guidance on abundance described above, bull trout in the Tucannon River Core Area were considered at intermediate risk of

inbreeding depression; bull trout in the Asotin Creek Core Area were considered at an increasing risk of inbreeding depression.

Productivity. A stable or increasing population is a key criterion for recovery under the requirements of the Endangered Species Act. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. Estimates of population growth rate (*i.e.*, productivity over the entire life cycle) that indicate a population is consistently failing to replace itself indicate increased extinction risk. Therefore, the reproductive rate should indicate that the population is replacing itself, or growing.

Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an index of a spawning adult population. The direction and magnitude of a trend in the index can be used as a surrogate for the growth rate of the entire population. For instance, a downward trend in an abundance indicator may signal the need for increased protection, regardless of the actual size of the population. A

population that is below recovered abundance levels but moving toward recovery would be expected to exhibit an increasing trend in the indicator.

The population growth rate is an indicator of extinction probability. The probability of going extinct cannot be measured directly; it can, however, be estimated as the consequence of the population growth rate and the variability in that rate. For a population to be considered viable, its natural productivity should be sufficient for the population to replace itself from generation to generation. Evaluations of population status will also have to take into account uncertainty in estimates of population growth rate or productivity. The growth rate must indicate a stable or increasing population for a period of time for the population to contribute to recovery.

Because of the depressed and probably declining population trend and the loss of range within the basin, bull trout in the Asotin Creek Core Area are currently at increased risk. The Tucannon River Core Area is considered at intermediate risk because of an apparent population trend that is not declining and that has low to moderate annual variability.

Connectivity. The presence of the migratory life history form within the Snake River Washington Recovery Unit was used as an indicator of the functional connectivity of the recovery unit and both core areas. If the migratory life form was absent, or if the migratory form was present but local populations lacked connectivity, the core area was considered to be at increased risk. If the migratory life form persisted in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. Or, if the migratory life form was present in all or nearly all local populations and had the ability to connect with other local populations, the core area was considered to be at diminished risk.

Migratory bull trout may persist in some local populations in the Tucannon River Core Area and, therefore, are considered to be at intermediate risk. Migratory forms in the Asotin Creek Core Area are believed to be absent or extremely limited in both local populations and are considered to be at increasing risk.

Recovery Criteria

Recovery criteria for bull trout in the Snake River Washington Recovery Unit are the following:

1. **Distribution criteria will be met when the total number of stable local populations has increased to 10 in the Tucannon River Core Area and**

   7 in the Asotin Creek Core Area. These local populations must occur in separate streams with broad distribution throughout each core area.

2. **Trend criteria will be met when the overall bull trout population in the Snake River Washington Recovery Unit is accepted, under contemporary standards of the time, as stable or increasing, based on at least 10 years of spawning survey data.**

3. **Abundance criteria will be met when the Tucannon River Core Area supports an average of 1,000 adult bull trout annually and when the Asotin Creek Core Area supports an average of 700 adult bull trout annually.**

4. **Connectivity criteria will be met when migratory forms are present in all local populations and when intact migratory corridors among all local populations in both core areas provide an opportunity for genetic exchange and diversity.**

Recovery criteria for the Snake River Washington Recovery Unit were established to assess whether recovery actions are resulting in the recovery of bull trout. The Snake River Washington Recovery Unit Team expects that the recovery process will be dynamic and will be refined as more information becomes available. While removal of bull trout as a listed species under the Endangered Species Act (*i.e.*, delisting) can only occur for the entity that was listed (Columbia River distinct population segment), the criteria listed above will be used to determine when the

Snake River Washington Recovery Unit is fully contributing to recovery of the population segment.

Research Needs

Using the best scientific information available, the Snake River Washington Recovery Unit Team has described recovery criteria and recovery actions that are necessary to recover bull trout in the Snake River Washington Recovery Unit. However, the recovery unit team recognizes that many uncertainties exist regarding bull trout population abundance, distribution, and limiting factors and regarding actions needed to recover bull trout in the Snake River Washington Recovery Unit. Therefore, to implement effective management goals and recovery tasks within the Snake River Washington Recovery Unit, this recovery chapter will remain a flexible "working" document that uses new information as it becomes available. As part of this adaptive management approach, the Snake River Washington Recovery Unit Team has identified the need to initiate studies on bull trout habitat, genetics, abundance, and distribution in both core areas of the Snake River Washington Recovery Unit. Detailed feasibility studies may also be necessary to evaluate major habitat reconstruction projects and an artificial propagation program.

A primary research need is a complete understanding of the role that the mainstem Snake River should play in the recovery of bull trout. Fluvial bull trout probably comprised a strong component of local populations throughout the Snake River Washington Recovery Unit, including the areas in which bull trout are believed extirpated or persist in core populations with very low densities, such as in Asotin Creek. An important initial goal for the Snake River Washington Recovery Unit is to determine the current distribution and abundance of bull trout within each core area. The application of a scientifically accepted protocol such as that described in the draft *Protocol for Determining Bull Trout Presence* (Peterson *et al*. 2001), which is currently being evaluated by the Western Division of the American Fisheries Society, is recommended for this task. The American Fisheries Society protocol consists of standardized and statistically rigorous methods for determining the distribution of bull trout. Many other scientifically accepted guidance protocols are available and may be considered. The Washington Department of Fish and Wildlife has a State-

developed guide by Bonar *et al.* (1997) for sampling the distribution and abundance of bull trout. Applying such a protocol will improve the ability of the Snake River Washington Recovery Unit Team and various resource agencies to identify the extent and strength of local populations in each core area. A standardized protocol will also provide a solid basis for revising local and core population classifications and for making prudent decisions about recovery strategies.

Specifically, tributaries that have had isolated or anecdotal reports of bull trout capture should be targeted to verify bull trout distribution. In both core areas, there is an urgent need to develop and implement a standardized monitoring and assessment protocol for bull trout spawning surveys and for juvenile recruitment estimates. Such monitoring and assessment protocols are also crucial to monitor the effectiveness of recovery actions. And developing and applying methods to assess population trends and extinction risk are necessary to provide data and to refine recovery criteria throughout the recovery process.

To ensure that restoration activities to recover bull trout include a focus on the critical limiting factors, survival rates for each bull trout age class must be assessed. Currently, we do not fully understand the relative contributions to bull trout decline of each limiting factor related to the mainstem Snake River environment, stream conditions, and migratory corridors. Significant data gaps exist for each of these habitat areas in the Snake River Washington Recovery Unit. The recovery unit team has placed high priorities on investigating specific habitat-limiting factors and key population attributes to ensure that future restoration projects are well focused and provide maximum benefits toward bull trout recovery. Examples of these studies include radio-tracking bull trout to assess movements, habitat use, juvenile rearing, and survival and identifying water temperature limitations in migration corridors.

Throughout the Snake River Washington Recovery Unit, efforts should be made to evaluate and identify (via feasibility study) which unoccupied tributaries have the greatest potential to support bull trout in the future. This work would evaluate stream habitat characteristics such as water temperature, groundwater influence, substrate size and movement, bed and bank stability, pool frequency, and large woody debris. This information can then be used to prioritize restoration efforts

and to identify steams where artificial introduction or reintroduction may be feasible to expedite recovery.

The Role of Artificial Propagation and Transplantation

As described in Chapter 1, section 3(3) of the Endangered Species Act lists artificial propagation and transplantation as methods that may be used for the conservation of listed species. While artificial propagation has played an important role in the recovery of other listed fish species, the overall recovery strategy for bull trout in the Snake River Washington Recovery Unit, where possible, will emphasize identifying and correcting threats affecting bull trout and bull trout habitats. If artificial propagation is determined to be necessary for bull trout recovery within the Snake River Washington Recovery Unit and if a feasibility study identifies streams capable of supporting bull trout, the joint policy of the U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding controlled propagation of listed species will be followed (65 FR 56916).

Also, an appropriate plan would need to be approved to consider the effects of transplantation on other species as well as on the donor bull trout populations. Transplanting listed species must be authorized by the U.S. Fish and Wildlife Service through a 10(a)(1)(A) recovery permit, and methods must meet applicable State fish-handling and disease policies.

In numerous streams within the Asotin Creek Core Area (Charley, George, Coombs, Hefflefinger, lower Wormell Gulch, and South Fork Asotin Creeks) and in several streams within the Tucannon River Core Area (Pataha and Hixon Creeks and the Little Tucannon River), bull trout may or may not be present in habitat that historically contained reproducing populations. These streams are considered candidate locations for artificial propagation or transplantation activities.

Though every effort should be made to recover a species in the wild before implementing a controlled propagation program, there are a limited number of bull trout in the Asotin Creek Core Area. Natural recolonization is probably not a viable solution for enhancing the existing abundance and distribution of bull trout in this

core area. Although bull trout in Asotin Creek may respond to habitat improvements in occupied and unoccupied streams, successful recovery will probably require an artificial propagation or transplant program.

Recent behavioral and genetic studies of bull trout support artificial propagation programs. These studies report that bull trout exhibit a high degree of fidelity to natal streams (James *et al.*, *in litt*., 1998; Spruell *et al.* 2000; Hvenegaard and Thera 2001). Strong fidelity for natal streams does not mean that fish movement between adjacent populations or adjacent basins does not occur, but such fidelity may mean that gene flow and colonization or recolonization of unoccupied habitat may take more than several generations. Therefore, to achieve recovery in the time frame specified in Chapter 1 and this Snake River Washington Recovery Unit chapter, some form of artificial propagation or transplanting may be necessary. If the current Asotin Creek bull trout populations have been isolated and functioning at low abundance for a long period of time, such a program may be necessary to immediately increase the number of individual fish in the core area and to infuse new genetic material into existing populations to avoid loss of alleles and heterozygosity (Spruell *et al*. 1999). Before implementation of any artificial propagation or transplantation program, a feasibility study would be completed to identify streams with the greatest potential to support local populations of bull trout and to identify the best available source of genetic material.

The Snake River Washington Recovery Unit Team also considered the findings of the Montana Bull Trout Scientific Group (MBTSG 1996). This group concluded that hatcheries are one of many potential tools that could be used in bull trout recovery and that hatcheries are appropriate for establishing genetic reserves for declining populations and for some research strategies (MBTSG 1996). The Montana Bull Trout Scientific Group identified seven strategies that use artificially propagated fish and evaluated these strategies in relation to recovery criteria and objectives. The group provided recommendations and further concluded that transplants into areas where bull trout have been extirpated should be considered only after the causes of extirpation are identified and corrected.

The Snake River Washington Recovery Unit Team recommends the following: (1) identify and correct threats in the Tucannon River and Asotin Creek Core Areas to increase bull trout densities and allow natural population expansion to occur within streams that have evidence of recruitment; (2) consider an artificial propagation program within each of the core areas only if a feasibility study indicates that such a program is the best option for recovery or to establish a genetic reserve; and (3) recognize that, even if threats are identified and corrected in the Asotin Creek Core Area, natural recolonization of bull trout in streams that once supported a local population may take an extended amount of time. In this case, supplementation or transplantation may be the best option. For this option, a feasibility study would be completed to identify streams with the greatest potential to support local populations. Supplementation or transplanting would then occur concurrently with other restoration and recovery activities.

Estimated Date of Recovery

Expected time periods necessary to achieve recovery will vary among recovery units due to differences in bull trout status, factors affecting bull trout, implementation and effectiveness of recovery tasks, and population responses to recovery tasks. At a minimum, four to five bull trout generations (20 to 25 years) are expected to pass before all of the highest priority recovery tasks are completed and bull trout populations respond at levels necessary to achieve recovery in the Snake River Washington Recovery Unit.

For the Tucannon River Core Area, a minimum of four to five bull trout generations (20 to 25 years) will probably pass before high-priority recovery actions can significantly reduce identified threats to bull trout and populations exhibit positive, recovery level responses. However, the recovery unit team expects local population trends (*i.e.*, redd counts) to increase concurrently, or with minimal time lag, following implementation of recovery activities. Recovery criteria should be met within four to five generations (20 to 25 years).

For the Asotin Creek Core Area, two scenarios for the estimated time frame needed for bull trout recovery were considered:

1. Promote natural recolonization within the Asotin Creek Core Area. If after four to five bull trout generations (20 to 25 years), all recovery measures prove ineffective to enhance natural reproduction of wild bull trout, implement a controlled propagation or transplant program. Because newly recolonized local populations within the Asotin Creek Core Area will be inherently small, straying rates and movement of fish to adjacent unoccupied areas may be a slow process. As a result, population growth and full colonization may take significantly longer. Achieving recovery criteria may take an additional four to five generations (20 to 25 years), therefore requiring eight to ten total generations (40 to 50 years) in Asotin Creek.

2. Initiate a controlled propagation or transplantation program to accelerate recovery time. The Snake River Washington Recovery Unit Team would begin this program only after identifying a suitable genetic source (preferably from bull trout within the basin) and completing a stream inventory and analysis (feasibility study). This analysis would identify habitats that meet minimum criteria (*e.g.*, adequate stream size, gradient, flow, groundwater contributions, temperature, pools and spawning substrate, and riparian cover) to support local populations or habitats that, with minimal improvements, could support bull trout local populations. Recovery within the Asotin Creek Core Area may take one to two additional generations (5 to 10 years) beyond the four to five generations needed to significantly reduce identified threats, given that a stream analysis and development of a controlled propagation program could take up to five years. Under this scenario, the recovery unit team expects that recovery criteria for the Asotin Creek Core Area could be achieved within five to seven bull trout generations (25 to 35 years).

The Snake River Washington Recovery Unit Team recommends that the actions described in scenario 2 should be implemented to increase the likelihood of bull trout persistence and recovery in the Asotin Creek Core Area.

ACTIONS NEEDED

Recovery Measures Narrative

In this chapter and all other chapters of the bull trout recovery plan, the recovery measures narrative consists of a hierarchical list of actions that follows a standard template. The first-tier entries are identical in all chapters and represent general recovery tasks under which specific (*e.g.*, third-tier) tasks appear when appropriate. Second-tier entries also represent general recovery tasks under which specific tasks appear. For a complete and thorough discussion of second-tier tasks, see Chapter 1. Second-tier tasks that do not include specific third-tier actions are either programmatic activities that are applicable across the species' range and appear in *italicized font* or are tasks that may not be sufficiently developed to apply to the recovery unit at this time and appear in *an italicized shaded font (as seen here)*. These tasks are included to preserve consistency in numbering tasks among recovery unit chapters and are intended to assist in generating information during the comment period for the draft recovery plan, a period during which additional tasks may be developed. Third-tier entries are tasks specific to the Snake River Washington Recovery Unit. They appear in the Implementation Schedule that follows this section and are identified by three numerals separated by periods.

The Snake River Washington Recovery Unit chapter should be updated or revised when recovery tasks are accomplished, environmental conditions change, or monitoring results or other new information becomes available. Revisions to the Snake River Washington Recovery Unit chapter will probably focus on priority streams or stream segments within core areas where restoration activities occurred and where habitat or bull trout populations have shown a positive response. The Snake River Washington Recovery Unit Team should meet annually to review annual monitoring reports and summaries and to make recommendations to the U.S. Fish and Wildlife Service.

1 Protect, restore, and maintain suitable habitat conditions for bull trout.

1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.

1.1.1 Identify unstable and problem roads causing fine sediment delivery. Survey and identify sediment delivery from County roads associated with the Tucannon River Road. Evaluate roads to identify sediment sources and sediment delivery points during rainstorms and spring runoff. Survey all bridges, culverts, fill slopes, and unstable road sections in areas of known local populations and potential local populations in the Tucannon River and Asotin Creek Core Areas.

1.1.2 Move roads that are in riparian areas out of the floodplain or stabilize them Where possible, move roads out of floodplains along streams that have known local populations of bull trout or streams that have been identified as essential for reestablishing local populations of bull trout. Where roads cannot be moved, stabilize them: recontour road fill slopes and seed with native vegetation to prevent slumping. Add adequate surface material, if needed, to prevent sediment movement.

1.1.3 Find and eliminate fine sediment sources from historical roads. Identify sources of fine sediment input from historical road networks on Federal and State lands that are managed as part of the Federal Wenaha-Tucannon Wilderness or the State-owned Wooten Wildlife Refuge, especially roads along bull trout spawning habitat in the Tucannon River. Reduce and prevent erosion from identified problem locations on motorized access roads and from closed roads at trailheads.

1.1.4 Improve routine road maintenance practices. Road maintenance practices have been identified as adversely affecting bull trout habitat where maintenance occurs on roads next to streams. Change or improve road maintenance

protocols on all Federal-, State-, and County- managed roads throughout the Tucannon River and Asotin Creek Core Areas to minimize erosion and riparian damage. Upslope road ditches should be directed to downslope areas away from stream channels and so be prevented from discharging into streams.

1.1.5 Restore stream channels to appropriate channel type. In the Asotin Creek Core Area, address intermittent stream problems in the lower 0.8 kilometer (0.5 mile) in George Creek and restore and maintain a functional, single-thread channel on lower George Creek from river kilometer 2.8 to 5.8 (river mile 1.6 to 3.6) and river kilometer 7.2 to 9.2 (river mile 4.5 to 5.7) by reconstructing meanders and restoring floodplains and riparian zones that contain trees and other sources for recruitment of large woody debris.

1.1.6 Reduce sediment inputs from recreational-based channel damage. Assess damaged areas and reduce sediment input from riparian and streambank alterations caused by motorized and nonmotorized use of access trails along the Tucannon River. Work with the managers of State and Federally owned campgrounds to relocate campgrounds out of the riparian zone and floodplain to prevent further damage to vegetation and streambanks if effective controls are not implemented.

1.1.7 Develop and install educational watershed protection signs in riparian areas of State and Federal campgrounds. In the Tucannon River Core Area, develop readily visible signs and notices asking campground patrons to help protect sensitive stream corridors. In the Asotin Creek watershed, develop riparian protection signs in sensitive streamside areas on State and Federal lands

1.1.8 Review and act on recommendations generated from sediment monitoring and abatement plans. Coordinate and review progress with landowners and land managers on Natural Resources Conservation Service sediment monitoring and abatement plans in the Asotin Creek watershed, especially Charley Creek, North Fork Asotin Creek, South Fork Asotin Creek, George Creek, and the mainstem of Asotin Creek. In the Tucannon River watershed, review and coordinate sediment abatement actions in response to sediment monitoring in Pataha Creek and the mainstem Tucannon River. Promote agricultural practices such as no-till seeding to reduce sediment delivery to streams identified for bull trout recovery.

1.1.9 Assess water quality and remedy impacts from individual residences and communities. Investigate the effects and relative threats to bull trout from septic tank leakage, waste water drainage, and other potential water quality problems originating from the City of Asotin and from the rural residential development concentrated in the lower 8 kilometers (5 miles) of Asotin Creek. In the Tucannon River, investigate the extent of these potential water quality problems at the towns of Starbuck, Marengo, and Pomeroy and at the concentrated rural development along the lower 25 kilometers (16 miles) of the mainstem Tucannon River. Recommendations should be made on actions to remedy water quality impacts.

1.1.10 Evaluate the need to install additional permanent stream gauging stations. Determine whether permanent stream gauging stations would aid enforcement of permitted irrigation diversion volumes and surface water rights in the upper Tucannon River, Pataha Creek, and Asotin Creek. If such stations would aid enforcement, install gauges and monitor stream flows.

1.1.11 Identify sources and locations of groundwater infiltration to streams. In bull trout local populations and potential local populations in the Asotin Creek Core Area, survey, locate, and map areas where groundwater percolates through the streambed and contributes to bull trout habitat. Use this information to correlate bull trout distribution with groundwater inflow and estimate the amount of bull trout habitat available in occupied and unoccupied streams.

1.1.12 Protect groundwater sources to maintain base flows in the Tucannon River and Asotin Creek. Groundwater is an important component of the base flows in the Tucannon River and Asotin Creek watersheds. Identify non-permitted groundwater uses and implement enforcement to protect groundwater sources at Starbuck, Marengo, Pomeroy, and the densely populated rural areas along the mainstem Tucannon River. Promote agricultural practices such as no-till seeding in Asotin Creek to protect base flows.

1.1.13 Identify factors contributing to elevated stream temperatures. Implement water temperature monitoring on State and Federal lands. Identify and correct reasons for temperature exceedences in bull trout migratory and rearing habitat in the Tucannon River and Asotin Creek Core Areas.

1.2 Identify barriers or sites of irrigation entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.

1.2.1 Remove permanent and seasonal barriers to bull trout migration. Identify complete or seasonal barriers caused by debris jams, irrigation wing dams, culvert drops, bridge crossings, or other manmade structures that hinder or prevent bull trout from accessing upstream spawning or rearing habitat in both core areas. In Asotin Creek, survey all culverts at

various flows in the mainstem of Asotin Creek, especially the main Asotin Creek Road culvert and the Charley Creek crossing, to make sure each is passable by adult and subadult bull trout. Evaluate fish passage and repair, if necessary, the perched road culvert at the Trent Ridge Road crossing in George Creek and the in-channel pond that may be a bull trout passage barrier.

1.2.2 Eliminate barriers to bull trout passage at remnant power and irrigation dams. Remove or modify the remnant Headgate Dam structure and existing fish ladder in Asotin Creek, and the Starbuck Dam structure in the Tucannon River, to allow free unimpeded movement of bull trout both upstream and downstream during all flow conditions.

1.2.3 Conduct a complete inventory of surface water diversions. Inventory all surface water diversions in the Tucannon River and Asotin Creek Core Areas. Evaluate compliance with State, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service screening criteria. Screen all diversions to meet State and Federal requirements.

1.3 Identify impaired stream channels and riparian areas and implement tasks to restore their appropriate functions.

1.3.1 Conduct watershed analyses to evaluate past, current, and future bull trout production potential. In the Tucannon River and Asotin Creek Core Areas, conduct watershed analyses to describe the past, current, and future (restored) potential of mainstem reaches and tributary streams to support bull trout recovery. To aid in adaptive management of recovery goals, identify site-specific tasks for recovery actions appropriate for individual watersheds. Watershed analyses are intended to generate a holistic understanding of land use and stream

conditions within a watershed. Analyses should identify likely historical conditions that can be used to develop restoration actions and to prioritize problems within a watershed. A complete watershed analysis should contain, at a minimum, assessments for roads, riparian areas, channel and flow characteristics, water temperatures, and habitat size. Relate watershed study plan to the needs of bull trout.

1.3.2 Identify streambanks susceptible to excessive failure and mass wasting. On National Forest lands in the Tucannon River and Asotin Creek watersheds, complete a road network survey to identify and map all stream reaches with actively eroding streambanks that are susceptible to excessive failure during high-flow events. Identify all head-cuts and incidences of mass wasting that may negatively impact riparian areas and inhibit natural stream functions.

1.3.3 Stabilize streambeds and banks. In Charley Creek, an Asotin Creek tributary, permanently repair active head-cut damage and revegetate the stream channel where mass wasting problems are associated with failure of two fishing ponds constructed in the stream channel. Head-cuts have enlarged this area, and excessive sediment is delivered to the lower reaches of Charley Creek and Asotin Creek. Repair streambanks in the Asotin Creek and Tucannon River watersheds on State and National Forest lands where streamside grazing occurs and where past timber harvest occurred with no stream buffer. Develop additional private landowner cooperation to restore streambanks, stream function, and floodplain connectivity on private grazing and agricultural lands along stream corridors.

1.3.4 Protect riparian and channel habitat at managed and unmanaged campgrounds, trail systems, and recreation sites.

Develop riparian and stream channel management plans to protect migration, spawning, and rearing habitat adjacent to trail systems, camping sites, and recreation sites. Relocate campgrounds out of riparian areas when necessary to avoid impacts to bull trout habitat. Restore and protect riparian and channel habitat along heavily used trails and trailheads.

1.3.5 Develop and implement comprehensive livestock grazing management plans. Develop, implement, and revise, when necessary, adaptive livestock grazing management plans. Include mid-season performance standards that maintain stream channel conditions for quality bull trout spawning and rearing habitat.

1.3.6 Identify and restore riparian vegetation in priority streams. Identify sites and revegetate to restore shade and canopy, riparian cover, and native vegetation to improve or maintain bull trout habitat.

1.3.7 Evaluate legacy effects from two historic mines on Cummings Creek. Evaluate current and legacy effects of mining to eliminate negative effects or to improve conditions.

1.3.8 Reduce fine sediment inputs from agricultural land. Identify sources and work with landowners and agriculture agencies to reduce fine sediment inputs to the Tucannon River and its largest tributary, Pataha Creek. In Asotin Creek, identify and reduce sediment sources to George, Pintler, Charley, and Lick Creeks.

1.3.9 Maintain roadless conditions in sensitive bull trout watersheds. Maintain roadless conditions on U.S. Forest Service lands in

the Tucannon River and Asotin Creek watersheds to protect bull trout headwater spawning and rearing areas.

1.3.10 Evaluate bridge crossings and assess options to modify structures to protect migration corridors. Evaluate the more than 20 bridge crossings in the Tucannon River watershed. Investigate the feasibility of installing appropriately designed crossings or culverts to improve channel function and fish passage at bridge sites or other crossings and make modifications where feasible.

1.3.11 Incorporate non-intrusive flood repair activities. Provide technical assistance to Asotin County, Columbia County, and private landowners on options for fish-friendly flood repair techniques that will help to improve or restore channel processes that benefit bull trout or their habitat. Much of the streambank along urbanized sections of the Tucannon River has been channelized, ditched, armored, or riprapped to protect roads and infrastructure.

1.3.12 Promote programs to restore and protect floodplain and channel function. Identify, promote, and continue incentives through the Asotin County, Columbia County, and Pomeroy Conservation Districts to promote programs centered on restoring floodplain and channel function in the mainstem of Asotin Creek below Headgate Dam and along the Tucannon River at the communities of Starbuck, Marengo, and Pomeroy.

1.3.13 Identify and restore aggrading stream channels to restore flow and reduce subsurface flows and increase channel stability. Conduct stream surveys to identify or better define problems and possible solutions to restore stream channel stability, function, complexity, and bedload sources that lead to reduced

surface flow and increased subsurface flow at the confluence of streams. Use this information to guide restoration activities in the Tucannon River Core Area, especially Charley, Cummings, and Pataha Creeks. Conduct the same surveys in the Asotin Creek Core Area, particularly in the mainstem of Asotin Creek and in George, Wormell Gulch, and South Fork Asotin Creeks.

1.3.14 Investigate land acquisition from willing sellers as an opportunity to protect bull trout. Where appropriate, pursue land purchases, easements, and agreements in the Tucannon River and Asotin Creek Core Areas along stream corridors that contain sensitive bull trout spawning, migrating, and rearing habitat. Pursue land exchanges with agencies and nongovernmental organizations to protect bull trout areas from future urban development and initiate activities to restore riparian and channel function when appropriate to protect bull trout habitat.

1.3.15 Reduce stream temperatures by enhancing riparian area. Reduce summer stream temperatures by restoring riparian forest buffers in both core areas. In the Asotin Creek Core Area, reduce temperatures in the mainstem of Asotin Creek, lower Charley Creek, George Creek, and South Fork Asotin Creek. In the Tucannon River Core Area, restore riparian vegetation or areas to help reduce summer temperatures on the mainstem Tucannon River from Marengo downstream, especially in the Wooten Wildlife Area, and in Pataha Creek from Columbia Center downstream to the confluence with the Tucannon River.

1.3.16 Reduce impacts of livestock on streams and riparian areas. To reduce impacts from livestock, work with landowners, managers, and agriculture agencies to fence around streams

and riparian areas in both core areas. Develop off-site livestock watering facilities.

1.3.17 Minimize further development in floodplains. Work with City and County agencies to rezone riparian areas or to develop a riparian area protection policy. Reduce or eliminate additional development of floodplain areas in the Tucannon River and Asotin Creek for any purpose except to dissipate flood water and energy or to perform restoration activities. Where possible, restore floodplain connectivity.

1.4 Operate dams to minimize negative effects on bull trout.

1.4.1 Implement bull trout identification protocol at juvenile and adult fishways at Lower Monumental, Little Goose, and Lower Granite Dams. Fully implement the bull trout identification protocol proposed by the U.S. Army Corps of Engineers to identify and count adult and juvenile bull trout at anadromous fish passage facilities. Elevate the importance of bull trout monitoring to counting personnel. Report results in electronic, tabulated form to the Snake River Washington Recovery Unit coordinator on an annual basis.

1.4.2 Review existing bull trout information and determine limiting factors affecting bull trout at Lower Monumental, Little Goose, and Lower Granite Dams. Analyze existing biological information and determine whether there are limiting factors causing take of bull trout that have not already been addressed through dam operations for salmon and steelhead.

1.4.3 Identify study needs related to habitats for foraging, migrating, and overwintering in Snake River reservoirs. Determine research needs associated with the operation of Lower

Monumental Dam, Little Goose, and Lower Granite Dams and with movement of bull trout from tributary streams into, and through, associated reservoirs. Conduct research on identified topics and then implement feasible remedies.

1.5 Identify upland conditions negatively affecting bull trout habitats and implement tasks to restore appropriate functions.

1.5.1 Assess effects of upland activities and current upland conditions on stream and riparian function. In the Asotin Creek watershed, identify adverse impacts to the stream system from tumbleweed dams and upland soil erosion that contributes to excess fines deposited in the streambed. In the Tucannon River watershed, identify measures to control upland soil erosion from rangeland. Implement corrective measures in both core areas.

1.5.2 Assess current and historical effects of upland management on occupied bull trout streams. Evaluate effects of upland management, particularly timber management, and agriculture and grazing practices in the Asotin Creek and Tucannon River Core Areas. Assess changes to the stream hydrographs, for example, timing and magnitude of both base and peak flows, and sediment sources that reach streams from upland sites. Use information to improve upland activities to increase base stream flows.

1.5.3 Investigate use of prescribed fire. Evaluate the use of prescribed fire to mimic natural disturbance to reinvigorate forested watersheds in both core areas. Review fire suppression efforts and emphasize continued fire suppression to reduce the risk of catastrophic fire, while not putting bull trout watersheds at risk. In Asotin Creek, evaluate methods to

reduce the potential for wildfire in North Fork Asotin Creek and Cougar Creek to protect small local populations.

2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

2.1 Develop, implement, and enforce public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.

2.1.1 Evaluate potential impacts of hatchery rainbow trout. Review and address potential impacts from continuing rainbow trout stocking programs in Spring, Blue, Rainbow, Deer, Watson, Beaver, Big Four, and Curl Lakes. Review the effectiveness of existing policies for public and private fish stocking for minimizing impacts on bull trout. Take action based on the results to reduce the risks to bull trout of unwanted fish introductions.

2.2 Evaluate enforcement of policies for preventing illegal transport and introduction of nonnative fishes.

2.3 Provide information to the public about ecosystem concerns of illegal introductions of nonnative fishes.

2.4 Evaluate the biological, economic, and social effects of control of nonnative fishes.

2.4.1 Evaluate impacts of nonnative fish species on bull trout. Upon evaluation of impacts from nonnative species, develop and implement strategies for removing or reducing nonnative fish that may compete directly for food and space with juvenile, subadult, or adult bull trout. Predetermine whether removal of any species is biologically feasible and whether removal is

economically and socially supportable in the Tucannon River and Asotin Creek Core Areas. Maintain current efforts at the Tucannon River Hatchery fish trap to stop upstream movement of bridgelip suckers and other nonnative fish.

2.4.2 Perform feasibility analysis to remove brook trout in Pataha Creek. Study the physical and economic potential for experimental removal of brook trout from Pataha Creek. Provide recommendations for methodologies and time frames.

2.5 Implement control of nonnative fishes where found to be feasible and appropriate.

2.5.1 Determine distribution and abundance of brook trout. Brook trout are believed to be partially responsible for extirpation of bull trout in Pataha Creek. Conduct fish surveys to determine the distribution and abundance of brook trout in Pataha Creek and the mainstem of the Tucannon River upstream from the mouth of Pataha Creek. Map brook trout distribution and calculate relative abundance to aid in the feasibility analysis for removing brook trout from Pataha Creek.

2.5.2 Encourage brook trout harvest in Pataha Creek. Remove harvest limits for brook trout to encourage harvest of the fish in Pataha Creek. Implement management strategies to ensure that brook trout populations do not expand into the Tucannon River from Pataha Creek.

2.5.3 Implement experimental removal of brook trout. If feasible, initiate a brook trout eradication program in Pataha Creek to assist with reestablishment of bull trout into Pataha Creek from the Tucannon River.

2.6 Develop tasks to reduce negative effects of nonnative fishes on bull trout.

2.6.1 Evaluate potential impacts from fish competition. Determine whether competition for resources occurs between bull trout and nonnative species and evaluate the potential negative impacts on juvenile and subadult bull trout in rearing areas of the Tucannon River and Asotin Creek. Impacts from competition with nonnative species and juvenile, subadult, and adult bull trout should be addressed in the lower Tucannon River (3 kilometers, or 2 miles), in areas that may serve as foraging, migrating, or overwintering habitat.

3 Establish fisheries management goals and objectives compatible with bull trout recovery and implement practices to achieve goals.

3.1 Develop and implement State and Tribal native fish management plans integrating adaptive research.

3.2 Evaluate and prevent poaching and incidental angling mortality of bull trout.

3.2.1 Reduce incidental harvest by outreach to recreational anglers and increasing awareness of bull trout population status. Reduce unintentional harvest of bull trout and mortality from catch-and-release fishing by making public education materials available and establishing interpretive signs at all high-use fishing access points. Increase education efforts during the steelhead fishing season when bait is allowed for steelhead angling. Education materials should include information on bull trout identification, fishing regulations, agency contacts, and appropriate catch-and-release handling techniques. Continue cooperating on education projects with the Native

American Tribes, the U.S. Forest Service, the Washington Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, anglers, other recreational organizations, and local newspapers.

3.2.2 Summarize existing bull trout bycatch (incidental capture) data and implement angler interviews that target bull trout bycatch. Review catch data for legal sport fisheries, especially for steelhead in the Tucannon River, to determine bull trout bycatch and estimate catch-and-release mortality. Implement a standard creel survey protocol that specifically targets bull trout bycatch information during steelhead angler interviews in the fall, winter, and spring. Implement the same protocol for anglers seeking other species during the summer. Use this information to support distribution and abundance trends for bull trout in both core areas and provide this information to the recovery unit coordinator on an annual basis.

3.2.3 Increase enforcement patrols during spawning periods. To reduce poaching of spawning adult bull trout, increase and focus State and Federal enforcement in all priority spawning streams, especially along easily accessible areas of the mainstem Tucannon River between Panjab Creek and Bear Creek during September, October, and November. Large fluvial bull trout (35 to 65 centimeters, or 14 to 26 inches) in the Tucannon River are particularly vulnerable and need increased protection during fall periods when recreational activities (fishing, hunting, and hiking) are high.

3.2.4 Minimize incidental bull trout mortality from angler-related hooking and handling. Reduce or eliminate angler impacts in open fishing areas where incidental mortality continues to be detrimental, especially in the mainstem Tucannon River between Cummings Creek and Panjab Creek and in stream

areas directly accessible by patrons of State and Federal campgrounds.

3.2.5 Use , review, and revise, where necessary, management goals for bull trout. Make efficient use of existing State and Federal fisheries management guidelines and policies designed to protect bull trout. Elevate bull trout priority when considering management actions for listed Snake River steelhead and spring chinook salmon.

3.3 Evaluate potential effects of nonnative fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.

3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.

3.4.1 Continue bull trout harvest closure in the Snake River Washington Recovery Unit. Continue implementing and enforcing fishing closures for bull trout in the Tucannon River and Asotin Creek Core Areas, at least until bull trout abundance and distribution have been fully determined, threats to production and population stability have been removed, and numbers of spawning adults show a definite increasing trend and have met recovery criteria.

4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.

4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.

4.1.1 Conduct genetic inventory. Collect samples for genetic analyses to contribute to establishing a program to understand genetic baseline and monitor genetic changes throughout the range of bull trout (see Chapter 1). Asotin Creek and the Tucannon River Core Areas are separated by the mainstem hydroelectric facilities at Little Goose and Lower Granite Dams. Although genetic analyses have not been initiated to provide conclusive evidence, interbreeding between these populations is very unlikely because of the physical distance separating these streams. Additional genetic information is needed to validate the separation of bull trout within the core areas of the Snake River Washington Recovery Unit. In Asotin Creek, collect tissue samples in a nonlethal manner and complete genetic analyses on bull trout in North Fork Asotin Creek and Cougar Creek. Genetic work for Asotin Creek bull trout must include objectives to determine whether a viable population exists and whether inbreeding depression has become a factor that could hinder recovery efforts. If time and money prevent simultaneous collection and evaluation of samples in both core areas, genetic analysis of Asotin Creek fish is a priority over that of Tucannon River fish. For the Tucannon River, collect tissue samples nonlethally from adult, subadult, and juvenile bull trout and complete a genetic analysis. Collect samples from populations using the mainstem Tucannon River between Panjab and Bear Creek and from direct tributaries including Cold, Sheep, Bear, Panjab, Meadow, Turkey, and Little Turkey Creeks. This genetic work is needed to provide an understanding of the genetic structure of local populations in both core areas and to provide a baseline from which to monitor genetic similarities and differences between bull trout in adjacent recovery units.

4.1.2 Evaluate and describe the genetic structure of bull trout in local populations. In the Tucannon River watershed, Panjab Creek

supports bull trout spawners in two of its tributaries, Meadow Creek and Turkey Creek. Bull trout also spawn in one of Meadow Creek's tributaries, Little Turkey Creek, and in the mainstem of Panjab Creek. All known spawning locations are headwater tributaries in close proximity to each another and have been described in the past as a single population. Evaluate genetic data to determine whether bull trout in Panjab Creek and its tributaries are a single spawning local population or multiple local populations that show genetic divergence. In Asotin Creek, evaluate the genetic structure of bull trout in Cougar Creek, North Fork Asotin Creek, and other potential local populations.

4.1.3 Perform genetic analyses on brook trout from Pataha Creek to determine whether hybridization between brook trout and bull trout has occurred. Collect tissue samples from brook trout in Pataha Creek to determine whether brook trout have hybridized with bull trout.

4.1.4 Monitor genetic changes in numbers and life forms to maintain long-term viability of bull trout in the Snake River Washington Recovery Unit (see discussion on monitoring and evaluation in Chapter 1).

4.2 Maintain existing opportunities for gene flow among bull trout populations.

4.3 Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.

4.3.1 Evaluate the genetic risks and benefits of reintroduction of bull trout. Evaluate the benefits and risks of introducing non-local bull trout genes into Asotin Creek. If benefits of reintroduction

are greater than risks and if natural recolonization is determined not timely enough to likely avoid local extirpations of bull trout in the watershed, develop genetic reserve protocols and standards for initiating, conducting, and evaluating a captive propagation program for Asotin Creek. Evaluate potential genetic sources from Tucannon River bull trout for possible reintroduction of bull trout into Pataha Creek following initial surveys of fish distribution and habitat conditions, restoration activities, and brook trout removal.

5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.

5.1 Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitats.

5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.

5.2.1 Conduct presence and absence surveys to fully describe the distribution of juvenile, subadult, and adult bull trout. Conduct standardized, intensive, and statistically sound electrofishing and/or snorkeling surveys in the upper mainstem of the Tucannon River from Tumalum Creek to Bear Creek and in tributaries including the Little Tucannon River and Cummings, Cold, Sheep, Bear, Panjab, Meadow, Turkey, Little Turkey, Hixon, and upper Pataha Creeks. In Asotin Creek, conduct the same intensive surveys in North Fork Asotin Creek, Cougar Creek, and other potential local populations. Design surveys to describe the full distribution and abundance of juvenile and subadult bull trout in the Tucannon River and Asotin Creek. Standardize and describe sampling methods and sampling

locations to allow repeatability of surveys. Repeat surveys every five to six years to facilitate assessment of effectiveness of recovery efforts through time and evaluate progress towards recovery goals.

5.2.2 Determine whether the hydropower system on the lower Snake River is adversely affecting migratory bull trout in the Tucannon River Core Area. Implement the three year radio-telemetry study (2002 to 2005) being proposed by the U.S. Fish and Wildlife Service to help meet reasonable and prudent measures and conservation recommendations associated with the lower Snake River Dams as outlined in the *Biological Opinion* for Federal Columbia River Power System for 2000 (USFWS 2000). This study will help to determine whether Tucannon River bull trout use the mainstem of the Snake River and, if they do, to help define the spatial and temporal distribution and movements of bull trout in lower Snake River reservoirs.

5.2.3 Conduct feasibility studies for artificial propagation and/or transplantation and implement programs. Conduct feasibility studies in the Asotin Creek Core Area and the Tucannon River Core Area to determine which tributaries or stream reaches contain habitat elements (*e.g.*, substrate, flow, temperature, groundwater contribution, pool habitat, spawning habitat, and riparian cover) necessary to support local populations that may be introduced via an artificial propagation program. Evaluate appropriate genetic sources, rearing techniques, and post-release monitoring protocols. Use results to develop and implement an artificial propagation program for potential streams in both core areas.

5.3 Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.

5.4 Evaluate effects of diseases and parasites on bull trout and develop and implement strategies to minimize negative effects.

5.5 Develop and conduct research and monitoring studies to improve information concerning the distribution and status of bull trout.

5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.

6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.

6.1.1 Identify partnership opportunities. Provide technical assistance to Asotin County Conservation District, Pomeroy Conservation District, and Columbia County Conservation District to identify cooperative restoration projects on private lands in the Asotin Creek and Tucannon River watersheds. Increase technical assistance to landowners for grazing management and agricultural practices; use existing Federal, State, and Native American Tribe cost-share programs and incentives to implement actions identified.

6.2 Use existing Federal authorities to conserve and restore bull trout.

6.3 Enforce existing Federal and State habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.

6.3.1 Work with involved agencies to modify emergency flood repair regulations that may impact bull trout habitat. Work with Asotin County and Columbia County to review emergency flood control procedures and, if possible, alter activities and regulations to reduce long-term impacts to bull trout habitat. For example, refrain from constructing more dike and riprap structures that cannot be removed after flood waters recede.

7 Assess the implementation of bull trout recovery by recovery units and revise recovery unit plans based on evaluations.

7.1 Convene annual meetings of each recovery unit team to generate progress reports on implementing the recovery plan for the U.S. Fish and Wildlife Service.

7.2 Develop and implement a standardized monitoring program to evaluate the effectiveness of recovery efforts.

7.3 Revise scope of recovery as suggested by new information.

7.3.1 Establish a Snake River Washington Recovery Unit bull trout coordinator. Identify a Snake River Washington Recovery Unit Team member to tally and summarize all projects that will benefit bull trout, coordinate the methods and collection of population trend data, store and organize survey and trend data, distribute information on recovery task status, and redirect recovery efforts within the scope of this Snake River Washington Recovery Unit chapter to reflect new information.

7.3.2 Periodically review progress toward recovery goals and assess recovery task priorities. Annually review progress toward population and adult abundance criteria and recommend changes, as needed, to the Snake River Washington Recovery Unit chapter. In addition, review tasks, task priorities, completed tasks, budget, time frames, particular successes, and feasibility within the Snake River Washington Recovery Unit.